



- 79 **How many grams of NaCl are required to precipitate most of the  $\text{Ag}^+$  ions from  $2.50 \times 10^2$  mL of 0.0113 M  $\text{AgNO}_3$  solution? Write the net ionic equation for the reaction.**

The net ionic equation is:  $\text{Ag}^+(aq) + \text{Cl}^-(aq) \longrightarrow \text{AgCl}(s)$

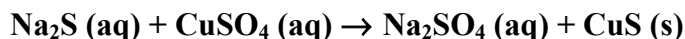
One mole of  $\text{Cl}^-$  is required per mole of  $\text{Ag}^+$ . First, find the number of moles of  $\text{Ag}^+$ .

$$\text{mol Ag}^+ = 2.50 \times 10^2 \text{ mL soln} \times \frac{0.0113 \text{ mol Ag}^+}{1000 \text{ mL soln}} = 2.83 \times 10^{-3} \text{ mol Ag}^+$$

Now, calculate the mass of NaCl using the mole ratio from the balanced equation.

$$2.83 \times 10^{-3} \text{ mol Ag}^+ \times \frac{1 \text{ mol Cl}^-}{1 \text{ mol Ag}^+} \times \frac{1 \text{ mol NaCl}}{1 \text{ mol Cl}^-} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = \boxed{0.165 \text{ g NaCl}}$$

- 80 **The concentration of  $\text{Cu}^{2+}$  ions in the water discharged from a certain industrial plant is determined by adding excess  $\text{Na}_2\text{S}$  solution to 0.800 L of the water. The molecular equation is:**



**Write the net ionic equation and calculate the molar concentration of  $\text{Cu}^{2+}$  in the water sample if 0.0177 g of solid CuS is formed.**

The net ionic equation is:  $\text{Cu}^{2+}(aq) + \text{S}^{2-}(aq) \longrightarrow \text{CuS}(s)$

The answer sought is the molar concentration of  $\text{Cu}^{2+}$ , that is, moles of  $\text{Cu}^{2+}$  ions per liter of solution. The factor-label method is used to convert, in order:

g of CuS  $\rightarrow$  moles CuS  $\rightarrow$  moles  $\text{Cu}^{2+}$   $\rightarrow$  moles  $\text{Cu}^{2+}$  per liter soln

$$\text{mol Cu}^{2+} = 0.0177 \text{ g CuS} \times \frac{1 \text{ mol CuS}}{95.62 \text{ g CuS}} \times \frac{1 \text{ mol Cu}^{2+}}{1 \text{ mol CuS}} = 1.85 \times 10^{-4} \text{ mol Cu}^{2+}$$

$$[\text{Cu}^{2+}] = \frac{1.85 \times 10^{-4} \text{ mol Cu}^{2+}}{0.800 \text{ L}} = \boxed{2.31 \times 10^{-4} \text{ M}}$$